ENGINE-PROPELLER MATCHING FOR FISHING VESSEL AT KUALA PAHANG BAY

MUHAMMAD ZARIHAN BIN ZAKARIA

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this project and in my opinion, this project is adequate in terms of scope and quality for the award of the degree of Bachelor of Mechanical Engineering with Automotive Engineering.

Signature
Name of Supervisor: DR. AGUNG SUDRAJAD
Position: LECTURER
Date: 6 DICEMBER 2010

STUDENT'S DECLARATION

I hereby declare that the work in this project is my own except for quotations and summaries which have been duly acknowledged. The project has not been accepted for any degree and is not concurrently submitted for award of other degree.

Signature
Name: MUHAMMAD ZARIHAN ZAKARIA
ID Number: MH07034
Date: 6 DICEMBER 2010

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ABSTRACT

Fishing vessel is a transport for fishermen to catch fish at the sea. Ship propulsion normally occurs with the help of a propeller while the propeller absorbs power from the engine to move. The propeller is depending on the engine and the ships resistance. So, whatever source of propeller power used, but it's still depending on those factors. So, the factors will affect the speed or power performance. Thus, the right combination of engine and propeller are required to give good performance, fuel economy and others. The objective of this project is to calculate the engine-propeller matching for fishing vessel at Kuala Pahang bay. By surveying the fishing vessel at the bay, collecting some data required to proceed to other steps. From the data, the resistance of the ship and also the power of the ship are calculated. From the result, a propeller and an engine is selected to find the matching point. At the point, the power output from the engine equals to power absorb by the propeller. So, the fishing vessel was operated in high efficiency, high performance and reduces its fuel consumption.

ABSTRAK

Kapal nelayan adalah pengangkutan nelayan untuk menangkap ikan di laut. Pergerakan kapal biasanya berlaku dengan bantuan kipas sementara itu kipas tersebut menyerap kuasa dari enjin untuk berputar. Kipas itu juga bergantung kepada enjin dan rintangan kapal. Jadi, apa-apa sumber kuasa kipas yang digunakan tetapi ia masih bergantung kepada faktor-faktor tersebut. Oleh itu, kombinasi yang betul antara engine dan kipas diperlukan untuk memberikan prestasi yang bagus, jimat minyak dan lain-lain. Objectif projek ini adalah untuk mengira padanan engine dan kipas untuk kapal nelayan di Kuala Pahang. Dengan membanci kapal nelayan di sana, data yang diperlukan dikumpul untuk meneruskan langkah seterusnya. Daripada data tersebut, rintangan kapal dan kuasa kapal dikira. Hasilnya, satu enjin dan satu kipas dipilih untuk mendapatkan titik sepadan. Pada titik tersebut, kuasa keluar daripada enjin sama dengan jumlah kuasa yang diserap oleh kipas. Pada keadaan itu, kapal nelayan beroperasi dalam kecekapan dan prestasi yang tinggi dan boley mengurang penggunaan minyak.

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Δ	Displacement
ρ	Density
φ	Viscosity of sea water
β	Coefficient
ηH	Hull efficiency
ηrr	Relative rotative efficiency
ηP	Propeller efficiency
ηS	Shaft efficiency
ηB	Brake efficiency
ηG	Gear efficiency
γ	Coefficient

CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

For the purpose of this project, the term “ship” is used to denote a vehicle employed to transport goods and persons from one point to another over water. Ship propulsion normally occurs with the help of a propeller.

Nowadays, the fishermen use fishing vessel to catch fish at the sea. Every day they go to the sea to catch the fish, the start the boat engine, then they pushing the throttle lever so hard that their hand numbs, without gaining an increase in speed, they vow to improve your boat's speed. Unfortunately, they just use the fishing vessel without care about the engine-propeller matching for their fishing vessel. So, by choosing the right propeller affect every phase of a ship performance, including handling, comfort of the ride, acceleration out of the hole, engine life, fuel economy, safety and the all importance element include top speed.

A propeller's relationship to a boat and forward motion in the water is directly related to a car's tire and the road. Matching the right traction to the available horsepower, load to be moved and top speed desired are just as important in the water as they are on land-based vehicles, or perhaps more so since water provides a liquid footing.

Today, the primary source of propeller power is the diesel engine, and the power requirement and rate of revolution very much depend on the ship’s hull form and the propeller design. Therefore, in order to arrive at a solution that is as optimal as possible, some general knowledge is essential as to the principal ship and diesel engine parameters that influence the propulsion system. Whatever source of propeller power used, but it's still depending on ship resistance and the propeller design.

A propeller is needed to generate adequate thrust to propel a vessel at some design speed with some care taken in ensuring some reasonable propulsive efficiency. Considerations are made to match the engine's power and shaft speed, as well as the size of the vessel and the ship's operating speed, with an appropriately designed propeller. Given that the above conditions are interdependent (ship speed depends on ship size, power required depends on desired speed). By following this to get understand the basic relationship between ship power, shaft torque and fuel consumption.

1.2 PROBLEM STATEMENT

In order to achieve the best of a ship performance, including handling, comfort of the ride, acceleration out of the hole, engine life, fuel economy, safety and the all importance element include top speed is about the boat resistance and propulsion. Before this, the fishermen just use the propeller without care about the characteristic of the propeller for their boat. The propeller is depending on the engine and the boat resistance. So, this problem will affect the speed or power performance. By achieving a best performance for the boat is designing the engine-propeller matching for fishing vessel.

1.3 OBJECTIVES

i. To calculate the engine-propeller matching for fishing vessel at Kuala Pahang Bay. From the calculation, the result will show the suitable engine power for certain diameter and fishing vessel size.

1.4 SCOPES OF PROJECT

There are three scope of the project as the limitation for the research. First, survey of fishing vessel type that has at Kuala Pahang bay. After that, the project scope is analysis of the general arrangement for that fishing vessel. Last, the calculation of engine-propeller matching for the fishing vessel.

1.5 PROCESS FLOW CHART

The processes of the project are based on the flow chart (refer next page Figure 1.1)

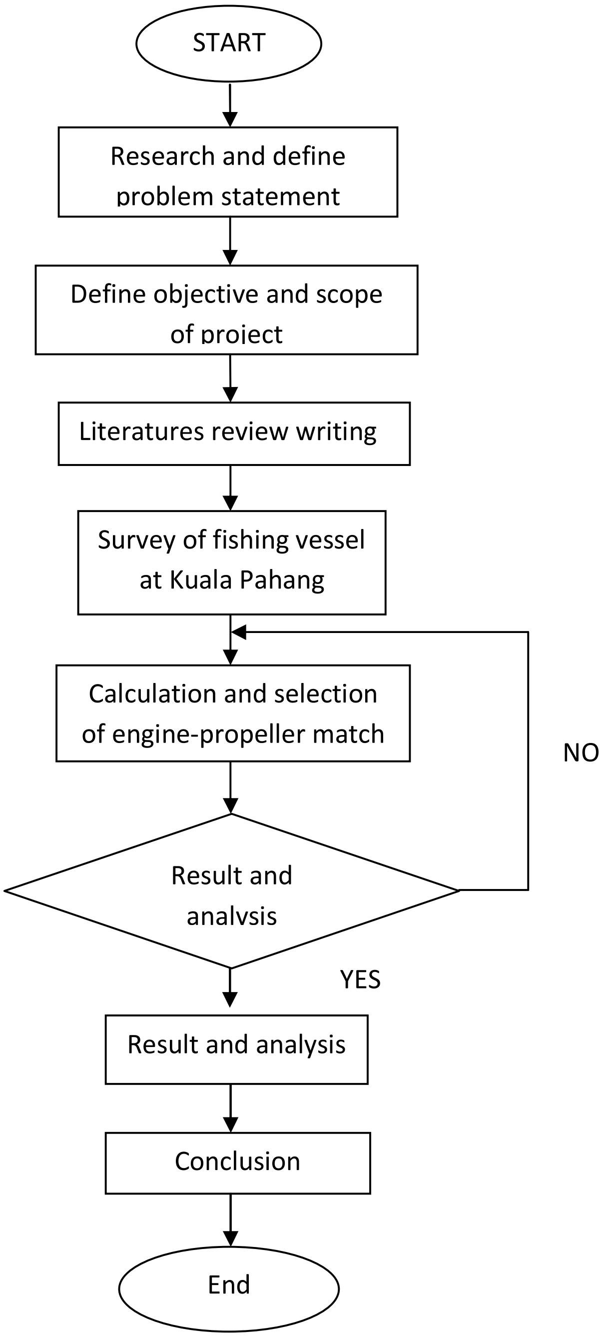

Figure 1.1: Process flow chart

CHAPTER 2

LITERATURE REVIEW

2.1 DESCRIPTION OF KUALA PAHANG

Figure 2.1: Location of Pekan

The figure above shows the location of Pekan, Pahang. The town is known as the City of Royal City as the place of residence and the Royal family and the central Pahang state government since time immemorial. In addition, the town is also famous as a center for trade and business. Its strategic location at the estuary of Sungai Pahang is a factor to this situation in view of the river to the main roads at that time.

Figure 2.2: Location of Kuala Pahang

Kuala Pahang area is about 3900 hectares while the water area is about 8022.52 hectares. Kuala Pahang also has about 4000 villagers which is the majority of the villagers' occupation is fisherman.

Figure 2.3: Location of Kuala Pahang Jetty

The Figure 2.3 shows the Kuala Pahang Jetty. This is where they stop and then unload their catch for the day.

Figure 2.4: Road to jetty

The arrows in the shows the way of the fishing vessel enter the estuary of Sungai Pahang to stop at the jetty.

2.2 Fishing Zone

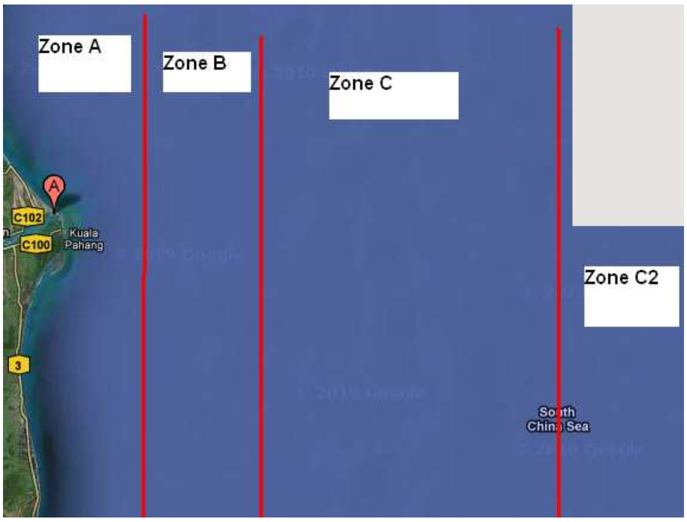

Figure 2.5: Fishing zones

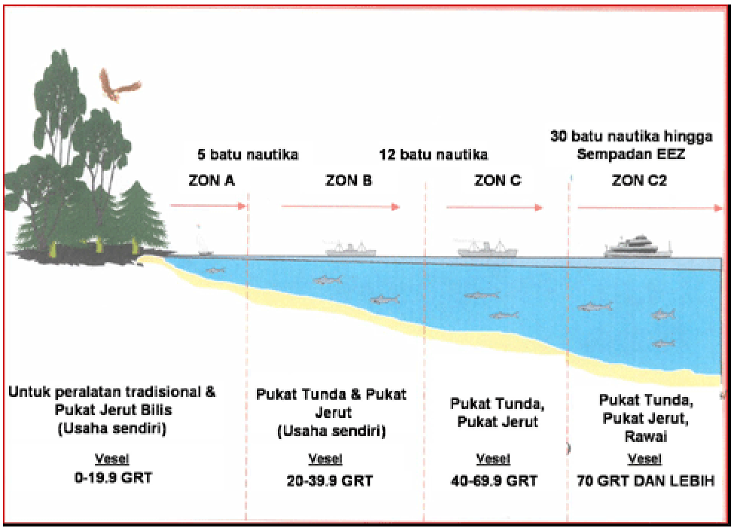

Figure 2.6: Fishing zones characteristic

Source: Jabatan Perikanan Malaysia

In Malaysia, there are four zones for fishing activities which are Zone A, Zone B, Zone C and Zone D. All zones is depends on their distance from the beach. Besides, each zone has their rules to follow by the fishermen like the trawl used and the size of fishing vessel use.

Zone A is about 5 nautical miles from the beach, using the traditional tools to fishing and tighten trawl with the size of fishing vessel is 0 to 19.9 GRT. Zone B's distance is five to 12 nautical miles. The fishermen in Zone B using the drag trawl and tighten trawl to fishing by using 20 to 39.9 GRT of fishing vessel size.

The next distance is 12 to 30 nautical miles which is for Zone C. The fishermen from this zone also use the drag trawl and tighten trawl to fishing while they using 40 to 69.9 GRT of fishing vessel. The last zone is Zone C2. The distance is more than 30 nautical miles. They are using drag trawl, tighten trawl and line trawl to fishing. The size of fishing vessel used there is the biggest which is 70 GRT and above.

However, the fishermen from Zone A can go to another zones but no suitable with their size of the fishing vessel. But the fishermen from Zone C2 cannot come to nearer zone because they will conquer all the area with their big fishing vessel and disturb the smaller fishing vessel.

2.3 Fishing vessel

The type of fishing vessel used in Kuala Pahang is anchovy dragnetters. The dragnetters usually operated near the shore. The average age of the boats was 7.6 years. The non-powered boats and the outboard-powered boats were about 6.7 years old whereas the inboard-powered boats were 9–14 years old. By size of management, the fishing fleet is composed of powered boats and nonpowered boats at 95.4 and 4.5 percent, respectively. About 76 percent of the poweredboats are outboard powered and the rest are inboard powered with different classes of gross tonnage.

Of the inboard-powered boats, those with less than 10 GT, 10–50 GT and over 50 GT account for 47.3, 37.9 and 14.8 percent, respectively. It was found that most of the non-powered boats use lift nets and traps, especially crab portable lift nets and crab traps. The majority of the outboard-powered boats use shrimp gillnets, followed by crab gillnets and traps. The inboard-powered boats of less than 10 GT mostly use otterboard trawls, crab and shrimp gillnets; those of 10–49 GT use otterboard trawls, squid cast nets and pair trawls; and those of 50 GT and over mostly use otterboard trawls, pair trawls and purse seines.

2.4 General Description of Engine-Propeller Matching.

Actually, propeller operates by both pushing and pulling at the same time. As a blade rotates it is moving downward, which moves water back and downward. As water is pushed in those directions, more water more water rushes in behind the blade to feel the void left by the moving blade. (Harvald. Sv. Aa, Guldhammer.H.E,1974)The result is a pressure differential between the two sides of the blade, with positive pressure causing a pushing effect on the underside and a negative pressure, or pulling effect, on the top side. Since this action is created on all sides of the propeller, the push-pull effect is increased with the speed of the prop.

Basically, boat moves on the water with any velocity will have resistance which is opposite direction with the boat direction. The thrust force value must be higher than the resistance force to make the boat is moving. The thrust force is produce by propulsor. Delivered power, P_D to the propulsion is come from the shaft power while the shaft power is produce by brake power, P_B which is external force of ship propulsor.

2.5 Description of Hull Form

It is evident that the part of the ship which is significance for its propulsion is the part of the ship's hull which is under the water line. The dimensions below describing the hull form refer to the design draught, which is less than, or equal to the scantling draught. The choice of the design draught depends on the degree of load whether, the ship, the ship will be heavily loaded. Generally, the most frequently occurring draught between the fully-loaded and the ballast draught is used. (Harvald.Sv.Aa, 1986)

2.5.1 Ship's lengthsL_{OA}, L_{WL} and L_{PP}.

The overall length of the ship L_{OA} is normally of no consequence when calculating the hull's water resistance. The factors used are the length of the waterline, L_{WL} and the so-called length between perpendiculars,L_{PP}. The dimensions referred to are shown in Figure 2.7.

The length between perpendiculars is the length between the foremost perpendicular, i.e. usually a vertical line through the stem's intersection with the waterline, and aft most perpendicular which, normally, coincides with the rudder axis. Generally, this length is slightly less than the waterline length, and is often expressed as:

$$L_{PP} = 0.97 \times L_W$$